The claim of the invention is:

1. A method for performing biological assay in a self-contained microfluidic-based luminescence biochip, the method comprising the steps of:

(a) providing said biochip with a plurality of compartments and interconnecting microchannels, said compartments having storage means for storing a plurality of samples, reagents, luminescent substrates, and reaction sites immobilized with probes; and means for interconnecting said compartments to provide fluid transfer through said microchannels;

(b) transferring sequentially at least one of said samples and then at least one of said reagents through said microchannels to at least one of said reaction sites, said at least one sample and said at least one reagent reacting with said probes and forming a probe complex;

(c) transferring said luminescent substrate through said microchannels to said reaction sites, said luminescent substrates reacting with said probe complex and generating luminescence; and

(d) detecting said luminescence with an optical detector located above or under said reaction sites.

2. The method as defined in claim 1, wherein said compartments further include washing buffers, the method further including a step prior to said step (c), said step comprising transferring said washing buffers through said microchannels to said reaction sites and washing away an excessive and un-reacting portion of said samples or said reagents.

3. The method as defined in claim 1 or 2, wherein one of said luminescent substrates is a chemiluminescent material or a bioluminescence material.

4. The method as defined in claim 1 or 2, wherein one of said reagents is an enzyme conjugate.

5. The method as defined in claim 1 or 2, wherein at least one of said samples is selected from a group consisting of proteins, antibodies, antigens, hormones, biological cells, and oligonucleotides.

6. The method as defined in claim 1 or 2, wherein one of said reagents is a branched DNA amplifier adapted for luminescence signal amplification.

7. The method as defined in claim 1 or 2, wherein means for interconnecting said compartments to provide fluid transfer is based on an external microactuator positioned above said compartments.

8. The method as defined in claim 1 or 2, wherein said microchannels have a dimension between 10μm – 3mm.

9. The method as defined in claim 1 or 2, wherein said compartments have a volume between 100nl – 500μl.

10. The method as defined in claim 1 or 2, wherein said compartments formed by thin film materials.

11. The method as defined in claim 1 or 2, wherein one of said reagents is dry reagent.

12. The method as defined in claim 1 or 2, wherein at least one of said biological probes is selected from a group consisting of proteins, antibodies, antigens, hormones, biological cells, and nucleic acids.

13. The method as defined in claim 10, wherein said biological probes are immobilized on a plurality of spots on at least one of said reaction site.